

CLAIMS

1. A method of constructing a refrigeration apparatus, comprising: a heat source unit (2, 102, 202, 502, 602, 1002, 1102, 1202, 1502) comprising a compressor (21) and a heat source side heat exchanger (23); a utilization unit (5, 1505) comprising a utilization side heat exchanger (51); and a liquid refrigerant connecting pipe (6, 1506, 7, 1507) that connects said heat source unit and said utilization unit; said method comprising the steps of:
- an equipment installing step that constitutes a refrigerant circuit (10, 510, 1510) by installing said heat source unit and said utilization unit, and connecting said refrigerant connecting pipe; and
- 10 a noncondensable gas discharging step that operates said compressor to circulate a refrigerant inside said refrigerant circuit, uses a membrane to separate a noncondensable gas remaining inside said refrigerant connecting pipe from the refrigerant flowing between said heat source side heat exchanger and said utilization side heat exchanger, and discharges the noncondensable gas out of said refrigerant circuit.
- 15 2. A method of constructing a refrigeration apparatus, comprising: a heat source unit (2, 102, 202, 502, 602, 1002, 1102, 1202, 1502) comprising a compressor (21) and a heat source side heat exchanger (23); a utilization unit (5, 1505) comprising a utilization side heat exchanger (51); and a liquid refrigerant connecting pipe (6, 1506, 7, 1507) that connects said heat source unit and said utilization unit; said method comprising the steps of:
- 20 a refrigerant circuit constituting step that constitutes a refrigerant circuit (10, 510, 1510) by connecting said heat source unit and said utilization unit via said refrigerant connecting pipe; and
- a noncondensable gas discharging step that operates said compressor to circulate a refrigerant inside said refrigerant circuit, uses a separation membrane (34b, 1034b) to separate a noncondensable gas remaining inside said refrigerant connecting pipe from the refrigerant flowing between said heat source side heat exchanger and said utilization side heat exchanger, and discharges the noncondensable gas out of said refrigerant circuit.
- 25 3. A refrigeration apparatus constructing method as recited in Claim 1 or Claim 2, wherein in said noncondensable gas discharging step, the refrigerant flowing between said heat source side heat exchanger (23) and said utilization side heat exchanger (51) is vapor-liquid separated into liquid refrigerant and gas refrigerant containing said
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noncondensable gas, and said noncondensable gas is subsequently separated from said vapor-liquid separated gas refrigerant.

4. A refrigeration apparatus constructing method as recited in Claim 3, wherein
in said noncondensable gas discharging step, separated said noncondensable gas is
released into the atmosphere.

5. A refrigeration apparatus constructing method as recited in any one claim of Claim 1 through Claim 4, further comprising:

a seal testing step that, before said noncondensable gas discharging step, performs a seal test on said refrigerant connecting pipe (6, 1506, 7, 1507); and

a sealed gas releasing step that, after said seal testing step, reduces pressure by releasing a sealed gas inside said refrigerant connecting pipe into the atmosphere.

6. A refrigeration apparatus (1, 101, 201, 501, 601, 1001, 1101, 1201, 1501) that constitutes a refrigerant circuit (10, 510, 1510), wherein a heat source unit (2, 102, 202, 502, 602, 1002, 1102, 1202, 1502) comprising a compressor (21) and a heat source side heat exchanger (23), and a utilization unit (5, 1505) comprising a utilization side heat exchanger (51), are connected via a refrigerant connecting pipe (6, 1506, 7, 1507), comprising:

a gas separation apparatus (31, 131, 231, 1031, 1131, 1231) comprising a separation membrane (34b, 1034b) connected to a liquid side refrigerant circuit (11, 511, 1511) that connects said heat source side heat exchanger and said utilization side heat exchanger, and that is capable of separating from the refrigerant and discharging out of said refrigerant circuit the noncondensable gas remaining inside said refrigerant connecting pipe by operating said compressor and circulating the refrigerant inside said refrigerant circuit.

7. A refrigeration apparatus (1, 101, 201, 501, 601, 1001, 1101, 1201, 1501) as recited in Claim 6, wherein

said liquid side refrigerant circuit (11, 511, 1511) further comprises a receiver (25) capable of accumulating the refrigerant flowing between said heat source side heat exchanger (23) and said utilization side heat exchanger (51); and
said gas separation apparatus (31, 131, 231, 1031, 1131, 1231) is connected to said receiver, and separates the noncondensable gas contained in the gas refrigerant accumulated in the upper part of said receiver.

8. A refrigeration apparatus (1, 101, 201, 501, 601, 1001, 1101, 1201, 1501) as recited in

said gas separation apparatus (31, 131, 231, 1031, 1131, 1231) further comprises a discharge valve (34c, 1034c) for releasing the separated noncondensable gas into the atmosphere.